

Halogen and proviso 1 were deleted since the proviso did not allow for the claimed substitution. The amendment to delete hydrogen is due to a typographical error. Neither amendment raise any new issues of matter.

The amendment to delete the phrase "fused heteroatom containing ring systems having 5 or 6 members" and insert the phrase "fused unsaturated five-member nitrogen containing ring systems, and fused saturated six-membered oxygen containing ring systems" is in response to the section 112, first and second paragraph rejections. The amendment more distinctly focuses the claim on the invention and does not include any new matter.

The amendments to the provisos are in response to 102 and 103 rejections by the examiner. The amended provisos are believed to obviate both rejections and to place the claims in condition for allowance.

I. Status of the Claims and Specification

Claims 1-21 are pending. Claim 1 has been amended.

II. Rejections Under 35 U.S.C. §112, Second Paragraph

Claims 1-2 and 4-5 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The Examiner contends that the scope of the terms "acyl" and "amido" is unknown. The Examiner alleges that the term "acyl" may include inorganic moieties, such as sulfonyl and phosphoryl, and that the term "amido" does not describe the nature of the groups on the nitrogen atom. The Examiner

further alleges that the term "fused heteroatom containing ring systems" is indefinite. This ground for rejection is not believed to be well taken and is respectfully traversed.

The term "acyl" is well known in the art to refer to carbonyl moieties. In the Dictionary of Science & Technology (1998), the term "acyl" is defined as a carboxylic radical, with the structure RCO, where R is an aliphatic group (See Exhibit 1). This definition does not suggest or indicate that inorganic moieties, such as sulfonyl or phosphonyl moieties may be referred to as "acyl" groups.

The term "amido" is also well known to comprise a nitrogen that may be substituted with zero, one or two alkyl groups. See Introduction to Organic Chemistry (Macmillan Publishing Company, p. 476) (Exhibit 2). This substitution pattern on the nitrogen is well known in the art.

In response to the Examiner's rejection of the term "fused heteroatom containing ring systems", claim 1 has been amended to more distinctly focus the scope of the claims to the substituents that are described in the specification on ~~page 5, lines 21-25 and example 16. Support for the synthesis of the claimed~~
compounds can be found within the specification at pages 8-14.

The recitation of halogen as a substituent and proviso 1 have been removed from claim 1 by amendment of the claim.

The typographical error noted by the Examiner, in claim 1, also has been amended.

III. Rejections Under 35 U.S.C. §112, First Paragraph

Claims 1-2 and 4-5 stand rejected as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and use the invention. The Examiner contends that the claims lack descriptive support for the fused 5- or 6-membered rings. This ground for rejection is not believed to be well taken and is respectfully traversed.

The amendment to claim 1 limits the fused rings to unsaturated five membered rings that contain nitrogen and saturated six membered rings that contain oxygen. The present specification provides descriptive support for these two fused ring classes (see page 5, lines 21-25 and example 16). There is sufficient information in the application to enable a person of ordinary skill in the art to make and use the invention defined by the amended claims. The specification provides representative compounds, as well as general synthetic methods to enable those skilled in the art to make and use the compounds defined by the present claims. Those skilled in the art would need no further information beyond that disclosed in the specification to practice the inventions defined by the subsisting claims.

In light of the amendments to claim 1 and the arguments presented, withdrawal of the §112 first paragraph rejection is respectfully requested.

IV. Rejections Under 35 U.S.C. §103(a)

Claims 1-2 and 4-5 stand rejected under 35 U.S.C. §103(a) over Ward (U.S. '078). The Examiner states that proviso 4 (new proviso 3) only excludes Ar' as pyridyl, but that Ar also can be pyridyl. The Examiner alleges that monopyridyl at Ar/Ar', which is taught by Ward, can be embraced by the claims even with proviso 4.

In response to this rejection, proviso 4 has been amended so that neither Ar or Ar' can be pyridyl. This amendment excludes the subject matter taught in Ward.

Accordingly, withdrawal of the §103(a) rejection is respectfully requested.

IV. Rejections Under 35 U.S.C. §102(b)

Claims 1-2 and 4-5 stand rejected under 35 U.S.C. §102(b) over Plilai *et al.* The Examiner contends that Plilai teaches compounds within the instant scope of the claims.

~~In response to this rejection, the Applicant's have amended claim 1, by the~~
addition of proviso 4, to exclude the compounds taught by Plilai.

Therefore, withdrawal of the §102(b) rejection is respectfully requested.

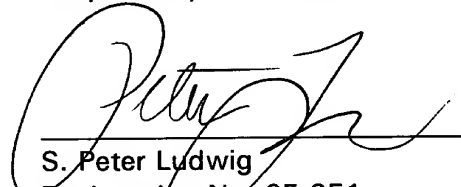
VI. Objections

Claims 3, 19, and 20 stand objected to as being dependent upon rejected base claims. The amendments to the base claims should obviate these objections.

CONCLUSION

In view of the foregoing amendments and remarks, the present claims are believed to be in condition for passage to allowance and such action is earnestly solicited.

Respectfully submitted,



S. Peter Ludwig
Registration No. 25,351
Attorney for Applicant(s)

DARBY & DARBY P.C.
805 Third Avenue
New York, N.Y. 10022
(212) 527-7700

WORDSWORTH



REFERENCE

The Wordsworth

Dictionary of Science & Technology



*A 'user-friendly' guide
to the modern world*

First published as *Chambers Science and Technology Dictionary*
by W&R Chambers Ltd, Edinburgh, and The Press Syndicate
of the University of Cambridge, 1988.

This edition published 1995 by Wordsworth Editions Ltd,
Cumberland House, Crib Street, Ware, Hertfordshire SG12 9ET.

Copyright © W&R Chambers Ltd and Cambridge University Press 1988.

All rights reserved. This publication may not be
reproduced, stored in a retrieval system,
or transmitted, in any form or by any means, electronic,
mechanical, photocopying, recording or otherwise,
without the prior permission of the publishers.

ISBN 1-85326-351-6

Printed and bound in Denmark by Nørhaven.

Contents

Preface
Subject categories
Contributors
Abbreviations
Greek alphabet
The Dictionary
Appendices
Paper Tables
Chemical Formulae
Chemical Elements
Periodic Table
Animal Kingdom
Plant Kingdom
Geological Time
Physical Constants
SI Conversions
Physical Constants



The paper in this book is produced from pure wood
pulp, without the use of chlorine or any other substance
harmful to the environment. The energy used in its
production consists almost entirely of hydroelectricity
and heat generated from waste materials, thereby
conserving fossil fuels and contributing little to the
greenhouse effect.

acy

activity

thermodynamic concentration of a substance the substitution of which for the true concentration permits the application of the law of mass action.

activity (Elec. Eng.). The magnitude of the oscillations of a piezoelectric crystal relative to the exciting voltage.

activity (Radiol.). Attribute of an amount of radionuclide. Describes the rate at which transformations occur. The unit is a becquerel (Bq).

activity coefficient (Chem.). The ratio of the activity to the true concentration of a substance.

activity constant (Chem.). The equilibrium constant written in terms of activities instead of molar concentrations.

a.c. transformer (Elec. Eng.). An electromagnetic device which alters the voltage and current of an a.c. supply in inverse ratio to one another. It has no moving parts and is very efficient.

Acutata (Zool.). Stinging hymenoptera, e.g. bees, ants, and some wasps.

aculeata (Bot.). Bearing prickles, or covered with needle-like outgrowths.

acuminate (Bot.). Having a long point bounded by hollow curves; usually descriptive of a leaf-apex. dim. *acuminulate*.

acupuncture (Med.). The practice of puncturing the skin with needles to produce analgesia, anaesthesia or for wider therapeutic purposes. The practice originated in China and the mechanism of action is not clear but it may stimulate the body to produce its own analgesic substances called endorphins.

acutance (Image Tech.). Objective formulation of the sharpness of a photographic image, expressed as:

$$G_s/(D_s - D_d)$$

where

$$G_s = \frac{\sum (\Delta D/\Delta x)^2}{N}$$

N = no. of increments between A and B , $D_s - D_d$ = average gradient of density curve, $\Delta D/\Delta x$ = maximum gradient curve.

acute (Bot.). Bearing a sharp and rather abrupt point: said usually of leaf-tips.

acute (Med.). Said of a disease which rapidly develops to a crisis. Cf. *chronic*.

acute angle (Maths.). An angle of less than 90°. Cf. *obtuse angle*.

acute phase substances (Immun.). Proteins which appear in the blood in increased amounts shortly after the onset of infections or tissue damage. They are made in the liver and include C-Reactive protein, fibrinogen, proteolytic enzyme inhibitors, transferrin. The stimulus is interleukin-1 (IL-1) released by macrophages. These proteins probably serve to counteract some of the effects of tissue damage.

ACV (Aero.). Abbrev. for *Air Cushion Vehicle* (hovercraft).

acyclic compound (Chem.). See *aliphatic compound*.

acylation (Chem.). Introduction of an acyl group into a compound, by treatment with a carboxylic acid, its anhydride or its chloride.

acetyl-CoA (Biol.). Coenzyme A conjugated by a thioester bond to an acyl group, e.g. acetyl-CoA, succinyl-CoA. These compounds are intermediates in the transfer of the acyl groups, e.g. the formation of citric acid by the interaction of acetyl-CoA with oxaloacetic acid.

acyl group (Chem.). Carboxylic radical RCO (R being aliphatic), e.g. CH_3CO .

acyle (Bot.). Having the parts of the flower arranged in spirals, not in whorls.

AD (Comp.). See *analogue-to-digital converter*.

ad (Genet.). Prefix signifying to, at.

A-D (Image Tech.). Analogue-to-Digital, referring to the conversion of signals.

ADA (Comp.). Programming language designed for complex on-line, real time monitoring (e.g. in military applications). Named in honour of Ada Lovelace.

adamantine (Min.). See *lustre*.

12

adder

adamantine compound (Chem.). Compound with the same tetrahedral covalent crystal structure as the diamond, e.g. zinc sulphide (sphalerite).

adambulacral (Zool.). In Echinodermata, adjacent to the ambulacral areas.

adamellite (Geol.). A type of granite with approximately equal amounts of alkali-feldspar and plagioclase.

Adam's apple (Zool.). In Primates, a ridge on the anterior or ventral surface of the neck, caused by the protuberance of the thyroid cartilage of the larynx.

Adams' catalyst (Chem.). A hydrogenation catalyst based on platinum oxide.

Adams sewage lift (Build.). An apparatus employed to force sewage from a low-level sewer into a nearby high-level sewer by using the sewage in the latter from a point that will give the air-pressure necessary to secure the lift of sewage.

adaptation (Behav.). Various meanings: *evolutionary adaptation*, adjustment to environmental demands through the long term process of natural selection acting on the genotype; *sensory adaptation*, a short term change in the response of a sensory system as a consequence of repeated or protracted stimulation; *adaptation* (child psychology), a term used by Jean Piaget to describe the developmental process underlying the child's growing awareness and interactions with the physical and social world. The process of *assimilation*, *accommodation*, and *equilibration* are fundamental to this concept of psychological adaptation.

adaptation (Bot., Zool.). Any morphological, physiological or behavioural characteristic which fits an organism to the conditions under which it lives; the genetic or developmental processes by which such characteristics arise.

adaptation of the eye (Biol.). The sensitivity adjustment effected after considerable exposure to light (*light adapted*), or darkness (*dark adapted*).

adapter (Elec. Eng.). Accessory used in electrical installations for connecting a piece of apparatus fitted with one size or type of terminals to a supply point fitted with another size or type.

adapter (Image Tech.). (1) An arrangement for using types of photographic material in a camera different from that for which it was designed; e.g. film-pack in a plate camera, or a smaller plate than normal. (2) A device for the interchange of lenses between different types of camera.

adaptive array (Radar). A radar antenna (either a *phased array* or an *active array*) whose gain, directivity and side lobes can be adjusted automatically to optimise the radar's performance under specific operating conditions.

adaptive radiation (Ecol.). Evolutionary diversification of species from a common ancestral stock, filling available ecological niches. Also *divergent adaptation*.

adapter hypothesis (Biol.). The prediction that some molecule would be needed to adapt the 4 base genetic code to the 20 amino-acid product. tRNA fulfils the prediction.

adaxial (Bot.). That surface of a leaf, petal etc. that during early development faced towards the axis (and usually, therefore, the upper surface of an expanded leaf). Cf. *abaxial*.

Adcock antenna (Telecomm.). Directional antenna consisting of pairs of vertical wires, spaced by one half wavelength or less, and fed in phase opposition; a figure-of-eight radiation pattern results, and arrays of Adcock antennae can be used for direction-finding.

ADD (Aero.). Abbrev. for *Airstream Direction Detector* (for stall protection).

addend (Maths.). See *addition*.

addendum (Eng.). Radial distance between the major and pitch cylinders of an external thread; the radial distance between the minor and pitch cylinders of an internal thread; also the height from the pitch circle to the tip of the tooth on a gear wheel.

adder (Comp.). Device which adds digital signals. It can also be applied to an amplifier in analogue computing. See *full-adder*, *half-*.

adder (Med.). So and also will exp.

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

adder's disease

THIRD EDITION

Introduction to Organic Chemistry

Andrew Streitwieser, Jr.

Clayton H. Heathcock

UNIVERSITY OF CALIFORNIA, BERKELEY

Macmillan Publishing Company *New York*

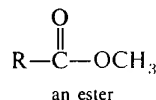
Collier Macmillan Publishers *London*

Chapter 18

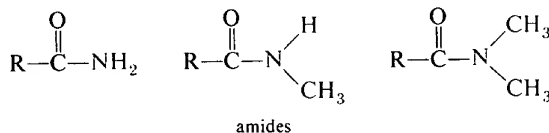
Derivatives of Carboxylic Acids

18.1 Structure

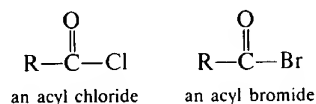
Functional group derivatives of carboxylic acids are those compounds that are transformed into carboxylic acids by simple hydrolysis. The most common such derivatives are esters, in which the hydroxy group is replaced by an alkoxy group.



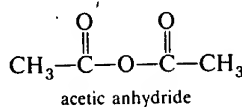
Amides are compounds in which the hydroxy group is replaced by an amino group. The nitrogen of the amino group may bear zero, one, or two alkyl groups.



Acyl halides are derivatives in which the carboxy OH is replaced by a halogen atom, acyl chlorides and acyl bromides are the most commonly encountered acyl halides.



Acid anhydrides are molecules in which one molecule of water has been removed from two molecules of a carboxylic acid. The only acyclic anhydride of general importance is acetic anhydride.



In a strict sense, nitriles are functional derivatives of carboxylic acids because they may be hydrolyzed to carboxylic acids (Section 17.6.A). The chemistry of nitriles has been discussed in Chapter 12.



The simplest ester, methyl formate, may be considered a derivative of formic acid in which the OH group is replaced by the OCH₃ group. Correspondingly, the molecular